Filing Receipt

Received - 2021-09-09 10:28:36 AM
Control Number - 52373
ItemNumber - 86

PROJECT NO. 52373

REVIEW OF WHOLESALE ELECTRIC MARKET DESIGN	§ §	**PUBLIC UTILITY COMMISSION OF TEXAS**

COMMENTS OF MITSUBISHI ELECTRIC TRANE HVAC

COMES NOW Mitsubishi Electric Trane HVAC and files these Comments in response to the Commission's Questions for Comment filed in this proceeding on August 2, 2021.

Executive Summary

Providing reliable power for all customers requires coordination from both the supply and demand side of the electric meter and efforts must be done in conjunction with one another to be successful. The events that affected millions of Texas customers in February illustrated a need for better solutions to provide reliable electricity and also address the electric burden the grid experienced to provide heat for public safety. While Demand Response is one of the solutions on the demand side of the equation being discussed, it does not resolve the inefficient HVAC, the root of the problem it is intended to control for winter and summer peaking.

Residential home heating and cooling traditionally make up the majority of the energy load in the home often followed by water heating. Demand Response for residential homes can generally only target those two items to reduce peak loads. However, stated clearly it only addresses the symptom vs the root of the major home load……HVAC. Therefore, Texas residential HVAC infrastructure should be a primary focus for the Commission, since all homes use some form of AC and 61% of Texas homes use electric for heating; electric resistance heating is the most inefficient and load intensive heating source. Since summer cooling and winter heating have major impacts to grid winter and summer peaking, it must be considered as part of the solution.

Inverter heat pump technology is the most effective solution to address this HVAC problem. Current inverter compressor heat pump technology readily available by most HVAC manufacturers has potential to immediately and permanently reduce winter peaking by over 50% with cold climate air source heat pumps (ccASHP) over electric resistance and summer peaking by 10-35% over standard central AC and window AC. Below are the primary recommendations for the Commission to take into consideration relative to HVAC in conjunction with other solutions such as energy efficiency and demand response:

- Prioritize and focus transition of residential electric heating to inverter ccASHP that do not require electric resistance back-up to provide 100% of the heating load.
- Significantly increase the minimum cooling efficiency standards SEER ratings. Note: 2023 Federal minimums standards of 15 SEER do not come close to the capabilities of current inverter compressor heat pump manufacturers with potential efficiencies of 30+ SEER[1].
- Mandate all new construction use inverter compressor heat pumps for HVAC needs. Example: Centerpoint Energy demonstrates this in their demand side management programs only paying utility HVAC incentives for mini-split heat pumps (ie inverter compressor heat pumps) on new construction homes.

Comments

Demand response has been presented as a focused solution to grid peak management however, it fails to represent the underlying HVAC load that causes problems during summer and winter peak events. Demand Response can address summer loads on central AC systems, however extreme cold events as reflected this past February cannot be deployed for most electric resistance

[1] Mitsubishi Electric Trane HVAC, https://www.mylinkdrive.com/viewPdf?srcUrl=http://enter.mehvac.com.s3.amazonaws.com/DAMRoot/Original/10006\M_SUBMITTAL_MSZ-FS06NA_MUZ-FS06NAH_en.pdf

baseboard and plug in electric heaters used today. The focus of this discussion will emphasize residential solutions that are proactive and target the source of the problem verses reacting to the problem as demand response is intended to do. Demand response can complement central HVAC systems but should not be a primary solution in of itself. Additionally, only a fraction of the HVAC load can be addressed with demand response. A contributing factor to the unsustainable load in the February event was electric resistance heating or inefficient sources of electric heating (ie outdated heat pump technology going to full electric resistance backup heating). Texas is also familiar with summer record breaking peak loads and this will continue to be a factor with the growth and development in major metro markets impacted by a base of antiquated AC technology that continues to get sold into the market today. As Texas faces more frequent extreme weather events, this problem will continue to exacerbate grid reliability if HVAC is not addressed more aggressively.

Replacing outdated and antiquated inefficient HVAC technology with inverter compressor heat pump technologies for cooling and heating in existing residential homes can immediately and permanently reduce load on the grid for the life of the equipment both in summer and winter extreme temperatures. In addition to targeting existing home retrofits, prioritizing electric heating, the rapid new construction growth must be addressed to avoid installations of the cheapest and least efficient equipment that keep the grid hostage to those loads for the life of the equipment. HVAC equipment life is approximately 20 years.

The income qualified community often lives in multifamily buildings heated by electric resistance heat, the most expensive and inefficient heating creating significant energy burdens for these tenants. Demand response does not solve residential electric resistance heating (baseboard or plug in heaters) or plug in window AC or PTAC units. According to census data 61%[2] of the heating in Texas is electric. Therefore, this reflects a significant opportunity in the state to address electric resistance heating with inverter compressor heat pumps that are approximately 200-400% more efficient. (Electric Resistance has Coefficient of Performance (COP) =1 and Inverter Compressor Heat Pumps COP 1.73 (@-13F) and 4.68 (@47F)[3]

Heat Pumps (HP) perform both heating and cooling from a single outdoor unit. Inverter Compressor Heat pump technology[4] is not new and has been in the US for over 40 years with the rest of the world using this technology long before arrival in the US market. Today, nearly every major HVAC manufacturer has some product line with inverter compressors and this technology is growing at a faster rate than any other HVAC solution but it still represents a small market segment. Simply put there is a difference between standard vs inverter compressors for AC or HP. A standard AC or HP compressor runs at a fixed speed and is either ON or OFF, no load or full load, similar to driving a car by pushing the accelerator to the floor or shutting off the engine entirely. Everyone would agree this would be a terrible way to drive a vehicle, but it is the way HVAC has been designed in the US for decades and is an antiquated compressor technology primarily being sold by contractors. An inverter compressor AC or HP operates at a variable speed consuming just enough power to meet the heating or cooling load but it is always on which delivers extremely comfortable living spaces maintaining precision temperatures. Majority of the run time for inverter compressor heat pump operates at minimal load which reduces power and has smoother impacts on the grid. A 2017 study shows that the daily average energy consumption (for

---

[2] Energy Information Administration. https://www.eia.gov/state/print.php?sid=TX. https://www.eia.gov/todayinenergy/detail.php?id=47116

[3] Mitsubishi Electric Trane HVAC, https://www.mylinkdrive.com/viewPdf?srcUrl=http://enter.mehvac.com.s3.amazonaws.com/DAMRoot/Original/10006\M_SUBMITTAL_MSZ-FS06NA_MUZ-FS06NAH_en.pdf

[4] Mitsubishi Electric Trane HVAC. How a Heat Pump Works. https://youtu.be/6XRtHAgklik

an 8-hour operating period) was 13.5 kWh for the standard AC and 8.7 kWh for the inverter type AC. Therefore, it is concluded that inverter technology can save about 35% of electricity consumed over a standard air conditioner. With the expected growth of air conditioner use and ambient temperature rise, inverter technology can significantly contribute to reduce the peak demand and energy use[5].

As mentioned above, not all heat pumps are created equal and many still perform poorly in heating mode which requires electric resistance back up at even moderate temperatures around freezing, defeating the benefit to the winter peaking load. Inverter compressor technology has afforded advancement in cold climate heating not achievable by standard heat pumps. Cold Climate Air Source Heat Pumps (ccASHP) using Inverter Compressors have the capability to provide 100% heating at -5F[6] and still achieving approximately a reduction of 50% of the energy load compared to electric resistance heat.

To validate the technology, Minnesota represents a very cold climate where significant third party research has validated ccASHP as technology capable of meeting extreme winter heating and correlates to even the most extreme events Texas experienced. Citing from a recent blog post;

> For a typical Minnesota home, a heat pump will reduce electricity use by 55%, mostly in heating. On typical, moderate climate days, heat pumps will reduce peak demand from electric resistance heat by over 60%. Given the high load of electric resistance heat, this can save approximately 4 kilowatts (kW) per home. In other words, heat pumps reduce

[5] Siriwardhana, M. and Namal, D.D.A., 2017. Comparison of Energy Consumption between a Standard Air Conditioner and an Inverter-type Air Conditioner Operating in an Office Building. SLEMA Journal, 20(1-2), pp.1–6. DOI: http://doi.org/10.4038/slemaj.v20i1-2.5

[6] Mitsubishi Electric Trane HVAC, https://www.mylinkdrive.com/viewPdf?srcUrl=http://enter.mehvac.com.s3.amazonaws.com/DAMRoot/Original/10006\M_SUBMITTAL_MSZ-FS06NA_MUZ-FS06NAH_en.pdf

winter peaks of traditional electric technologies approximately 10 times more than they reduce summer peaks. In Minnesota, 8% of single-family households heat with electricity. Replacing all these homes' electric systems with heat pumps would lower demand on moderate days by 570 MW[7]. With Texas electric heating at 61% this represents a significant opportunity to reduce winter load on the grid.

Summer central AC grid peaking is exacerbated by the standard compressor with poor energy efficiency that is manufactured by the same companies that also sell inverter compressor equipment. Unfortunately, little effort has been made to transform the market with contractors predominantly selling the cheapest and most inefficient equipment due to price which ultimately contributes to the summer grid constraints. Referring again to the 2017 study;

> It is concluded that inverter technology can save about 35% of energy over a standard AC. With the expected growth of AC use and ambient temperature rise due to global warming, inverter technology can provide significant savings[8]. Similarly, Minnesota had reduced AC load for summer cooling with heat pump over central AC reducing energy demand by approximately 10%[9].

In conclusion it is our recommendation that the Commission seek solutions and prioritize reducing the inefficient HVAC load on the grid. This can be done in conjunction with demand response solutions as this can take time to transition these HVAC retrofits. The immediate first priority should be to target all electric resistance heated residences with policy and significant utility rebates to rapidly transition the market. More broadly the adoption and rollout of inverter

---

[7] Edwards, Jenny. (2020, Oct 19). Electrification, Energy Efficiency, and Peak Demand. Center for Energy and Environment. https://www.mncee.org/electrification-energy-efficiency-and-peak-demand

[8] Siriwardhana, M. and Namal, D.D.A., 2017. Comparison of Energy Consumption between a Standard Air Conditioner and an Inverter-type Air Conditioner Operating in an Office Building.

[9] Edwards, Jenny. (2020, Oct 19). Electrification, Energy Efficiency, and Peak Demand.

compressor variable speed heat pumps can only be effective as policy and baseline minimums change to address the inefficient AC load. Current trends are moving toward elimination of Central AC for utility programs and moving toward heat pumps which include solutions such as dual fuel heat pumps that integrate with existing furnaces.

In addition to addressing the intent to improve grid reliability, customers will also benefit in terms of their lowering their overall heating and cooling energy costs.

Conclusion

Mitsubishi Electric Trane HVAC appreciates the opportunity to provide these Comments and looks forward to working with the Commission and other interested parties on these issues.

Respectfully submitted,

Kevin DeMaster

Kevin DeMaster
Mitsubishi Electric Trane HVAC
Sr. Manager Utilities & Electrification
Suwanee, GA
kdemaster@hvac.mea.com